



## GROWTH RESPONSE OF *Khaya senegalensis* (Desr) A. Juss. SEEDLINGS TO SELECTED ORGANIC MANURES

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### ABSTRACT

*The experiment on the growth response of Khaya senegalensis seedlings to selected organic manures was carried out in the Federal College of Forestry, Ibadan. The experiment was arranged in completely randomized design (CRD) with six treatments and seven replicates. Germination was observed for eight days. Assessment of growth parameters commenced two weeks after transplanting and was done weekly for 16 weeks. Total plant height, stem diameter and leaf production were measured. Data were analyzed using ANOVA at 5% probability level. Results showed that T<sub>4</sub> (10g of cow dung + 2000g of top soil) had the highest performance in terms of plant height (17.2cm) while T<sub>6</sub> (2000g of top soil) had the least height performance (14.9cm). Sources of manures had no significant influence ( $p < 0.05$ ) on the growth of Khaya senegalensis seedlings. The stem diameter growth of the seedlings was not significantly ( $p < 0.05$ ) influenced by the manures. T<sub>5</sub> (2.5g of Cow dung + 2.5g of Gliricidia sepium + 2000g of top soil) had the best performance with mean value 0.31mm. T<sub>6</sub> (control) had the least performance with 0.26mm. The highest mean leaf count was observed on the seedlings raised on 5g of Gliricidia sepium + 2000g of top soil with 9.5 while seedlings raised on 10 g of Gliricidia sepium + 2000g top soil had the least with 7.9. Manures had no significant effect ( $p > 0.05$ ) on the leaf production of the seedlings. Therefore, more research should be focused on the use of other sources of manures in raising Khaya senegalensis seedlings.*

**Keywords:** Growth, Manure, *Khaya senegalensis*, Seedlings, *Gliricidia sepium*

### INTRODUCTION

The importance of *Khaya senegalensis* both in furniture and in traditional medicines cannot be over emphasized. It has contributed immensely to our economy because of its high production of wood content in its tree species. This has enabled its use conventionally for carpentry, interior trim and construction (Lemmens *et al.*, 2008). *Khaya senegalensis* is a deciduous evergreen tree that belongs to the meliaceae family with common name African mahogany tree. *Khaya senegalensis* is a tree, 15 – 30m high up to 1m in diameter with a clean bole to 8 – 16m, buttress not prominent or absent, bark dark grey, with small thin, reddish, tinged scale, slosh dark pink to bright crimson, exuding a red sap. (Orwa *et al.*, 2009).

*Khaya senegalensis* comprises four (4) species in mainland Africa of which one or two of them are endemic to the Comoros and Madagascar. *Khaya* species strongly resemble each other in flower and fruit, and differences are more prominent in their leaflet. (Arbonnier, 2004). Some of the species in

the genus of *Khaya* are: *Khaya senegalensis*, *Khaya grandifolia*, *Khaya ivorensis*, *Khaya anthotheca*.

Manure on the other hand, are organic materials which contain three most important substances for plant growth- Nitrogen, Phosphate and Potash. Manure is added to the soil for several reasons. It improves the physical conditions of the soil. It also keeps up the level of humus in the soil and maintains the best conditions for the activities of soil organisms (Opunni-Fimpong, 2006). In addition, it makes up for the plant nutrients which have been removed by crops or lost by leaching and soil erosion. Out of the two basic types of manures, organic manure is considered best because it is from a natural source and has no adverse effect on human being when the end product is consumed. It is therefore necessary to investigate some manures that can increase the growth of *Khaya senegalensis* seedlings for sustainable production at the nursery stage.

## MATERIALS AND METHODS

### Study Area

The experiment was carried out in Federal College of Forestry, Ibadan. The college is located in Ibadan North West Local Government Area of Oyo state at Latitude 7° 23'N and 7°26'N and Longitude 3° 36'E and 3° 52'E of the Greenwich meridian. It has an annual rainfall of about 1400-1500mm and average relative humidity of about 65%. There are two distinct seasons that are notable in the area which are dry and wet (raining) season. (FRIN 2019)

### Procedure

Freshly collected seeds of *Khaya senegalensis* seeds were collected from a mother tree at the Forestry Research Institute of Nigeria (FRIN) Ibadan. The seeds were then planted into the germination basket filled with sterilized river sand. Watering was done once a day to enhance seed germination. Meanwhile, *Gliricidia sepium* leaves and cow dung were collected separately and air dried for a period of 2 weeks, grinded into powdered form, mixed with topsoil and then filled into the polythene pots in different quantities. After germination (8days), the seedlings were carefully pricked from the germination basket and then transplanted into the polythene pots. The readings were taken every week.

The treatments are: T<sub>1</sub> =5g of *Gliricidia sepium*+ 2000g (2kg) of top soil, T<sub>2</sub> = 5g of cow dung+ 2000g (2kg) of top soil, T<sub>3</sub> = 10g of *Gliricidia sepium*+ 2000g (2kg) top soil, T<sub>4</sub> =10g of cow dung+ 2000g (2kg) top soil, T<sub>5</sub> =2.5g of *Gliricidia sepium*+ 2.5g of cow dung + 2000 g (2kg) of top soil, T<sub>6</sub> = 2000 g (2kg) of top soil (control).

### Experimental design

The experiment was arranged in a Completely Randomized Design (CRD) with six (6) treatments and seven (7) replicates. Stem diameter (mm), seedlings height (cm) and leaf production were assessed.

### Data Analysis

Data collected were analysed using analysis of variance (ANOVA).

## RESULTS

The characteristics of soil is very vital in plant growth and development and this is determined by the nutrient composition of the soil. The result (Table 1) indicated that the total N was higher in top soil (1.35%) than in other media used for the experiment, while potassium and phosphorus was higher in cow dung with 1.0 cmol/kg and 1.5 cmol/kg respectively. This is a proof that the medium used for the study is good enough for planting as it contains the necessary nutrients needed for plant growth.

**Table 1: Chemical analysis of top soil, cow dung and *Gliricidia sepium* leaves**

Parameters	Top soil	Cow dung	<i>Gliricidia sepium</i>
Moisture content%	1.74	0.09	0.09
Total N%	1.35	1.34	0.78
K (Cmol/kg)	0.19	1.0	0.9
P (Cmol/kg)	1.24	1.5	1.2
Mg (Cmol/kg)	1.94	0.21	0.14

### Effect of cow dung and *Gliricidia sepium* leaves on seedlings height, stem diameter and leaf production of *Khaya senegalensis* seedlings

#### Plant height

The result on plant height (Table 2) shows that T<sub>1</sub> (5 g of *Gliricidia sepium* + 2000g of top soil), T<sub>2</sub> (5g of cow dung + 2000g of top soil), T<sub>4</sub>(10g of cow dung + 2000g of top soil) and T<sub>5</sub>(2.5g of *Gliricidia sepium* + 2.5g of cow dung + 2000g of top soil) had a relatively close mean values with 16.5cm, 16.9cm, 17.2cm and 17.0cm respectively, however, T<sub>4</sub> had the highest performance in terms of plant height indicating that high quantity of

cow dung had a positive effect on the height of *Khaya senegalensis* seedlings. T<sub>6</sub> (control) (2000g of top soil), however had the least performance in terms of plant height with 14.9cm. The manure had no significant influence ( $p>0.05$ ) on the plant height of the species (Table 3).

#### Stem diameter

The result on stem diameter (Table 2). revealed that T<sub>5</sub> (2.5g of Cow dung + 2.5g of *Gliricidia sepium* + 2000g of top soil) had the best performance with mean value 0.31mm, however, 5 g of *Gliricidia sepium* + 2000 g of top soil T<sub>4</sub>

(10 g of Cow dung + 2000 g of top soil) and T<sub>5</sub> (2.5 g of Cow dung + 2.5 g of *Gliricidia sepium* + 2000g of top soil) had a relatively close mean values with 0.29mm, 0.30mm, 0.31 mm respectively indicating that the mixture of both cow dung and *Gliricidia sepium* had a positive effect on the stem diameter of the seedlings. The result also revealed that plants in T<sub>6</sub> (control) had the least performance in stem diameter, with 0.26mm. The manure had no significant influence at  $p > 0.05$  on stem diameter of the species (Table 3).

### Leaf production

Result (Table 2) indicated that 5 g of *Gliricidia sepium* + 2000 g of top soil produced the highest number of leaves with 9.5. However, 5 g of *Gliricidia sepium* + 2000g of top soil), 5 g of cow dung + 2000g of top soil) and T<sub>4</sub> (10g of cow dung + 2000 g of top soil) had a relatively close mean values with 9.5, 9.4 and 9.3 respectively. The result also further revealed that plants on T<sub>3</sub> had the least performance in terms of leaf production with mean value of 7.9. The manure had no significant influence at  $p > 0.05$  on leaf count of the species (Table 3).

**Table 2: Effect of manures on seedlings height, stem diameter and leaf production of *Khaya senegalensis* seedlings**

Treatments	Plant height (Cm)	Stem diameter (Cm)	Leaf production Count (No)
1	16.5	0.29	9.5
2	16.9	0.27	9.4
3	15.6	0.28	7.9
4	17.2	0.30	9.3
5	17.0	0.31	8.9
6	14.9	0.26	9.1

**Table 3: Analysis of variance for the effect of manures on the growth of *Khaya senegalensis* seedlings**

Sources of variation	SS	df	MS	F	P-value	F cal
<b>Seedlings height</b>						
Treatments	42.708	5	8.542	0.1456	0.981	2.342
Error	4224.40	72	58.672			
Total	4267.107	77				
<b>Stem diameter</b>						
Treatments	1.346	5	0.269	0.264	0.932	2.342
Error	73.54	72	1.021			
Total	74.887	77				
<b>Leaf production</b>						
Treatments	19.008	5	3.802	0.139	0.983	2.342
Error	1970.154	72	27.363			
Total	1968.162	77				

*Not significant  $p > 0.05$*

### DISCUSSION

Organic manure consists of three most important substances for plant growth- Nitrogen, Phosphate and Potash. Manure is added to the soil for several reasons, with ultimate aim of improving soil nutrients. Various researchers who worked on the effect of organic manures on the growth of some tropical trees species gave similar results to that of the present study {(Mbakwe and Nzekwe (2005); Baiyeri (2002))}. The result also agreed with the findings of Mbakwe and Nzekwe (2005) who

observed that organic manures had effect on the growth of the seedlings of *Irvingia wombulu* (Vermeosen); this was in conformity with the observations obtained in this study. The findings by Baiyeri (2002) on two tropical tree species [*Anarcadium occidentale* Linn (cashew) and *Treculia africana* Decne (African breadfruit)] grown on five nursery media formulated from top soil and organic manures at different ratios showed significant effect on seedling emergence of cashew. This study was also supported the

findings of Orwa *et al.*, (2009) that organic manure was seen to improve the growth of *Khaya senegalensis*. Furthermore, organic manure keeps up the level of humus in the soil, maintains the best conditions for the activities of soil organisms and then makes up for the plant nutrients which have been removed by crops. This was in accordance with the findings of Gideon (2012) who reported that organic manure improved soil nutrients and thus enhanced the seedling growth of *Khaya grandifolia*.

## CONCLUSION

The study revealed the potentials of Cow dung and *Gliricidia sepium* at varying levels as good

sources of organic manure for the enhancement of the growth of *Khaya senegalensis* most especially at the nursery stage. The treatments also reflected an excellent performance on plant height, stem diameter and leaf production of the tree species.

## Recommendations

Based on the findings from this study, it is recommended that Cow dung as well as the mixture of *Gliricidia sepium* and Cow dung be adopted by the farmers in raising *Khaya senegalensis* seedlings. More so, other experiments should be carried out on the use of other sources of manures in raising *Khaya senegalensis*.

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